A CLINICAL STUDY OF POST BURN BREAST RECONSTRUCTION

A dissertation submitted to the Tamil Nadu Dr.M.G.R.Medical University in the partial fulfillment of the requirement for the award of M.Ch. Branch III (Plastic Surgery) degree August 2006-2009

CERTIFICATE

This is to certify that the dissertation entitled **"A CLINICAL STUDY OF POST BURN BREAST RECONSTRUCTION"** is the bonafide original work done by **Dr. Binita Beck.** This study was undertaken at the **Christian Medical College Hospital, Vellore** from the year December 2006 – December 2008 under my direct guidance and supervision, in partial fulfillment of the requirement for the award of the **M.Ch** Branch III (Plastic Surgery) degree **of the Tamilnadu Dr.M.G.R. Medical University.**

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ACKNOWLEDGEMENT

I have great pleasure in thanking my teacher Prof, Prema Dhanraj Professor and Head of the Department of Plastic & Reconstructive Surgery, Christian Medical College for permitting me to use the clinical materials and for guiding me through the preparation of the dissertation.

I owe my sincere thanks to Prof. Ashish Kumar Gupta , Professor. Department of Plastic & Reconstructive Surgery for his guidance and encouragement throughout this study

My sincere thanks to my teacher Dr. M. Kingsly Paul, Associate Professor, who gave valuable advise, support and encouragement throughout the preparation of this thesis.

I sincerely acknowledge the help rendered by Dr. Selvaraj, Department of Biostatistics in performing the statistical analysis of data.

I am also grateful to other faculty members of the Department and my post-graduate colleagues who helped me in all possible ways in this study.

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AIMS AND OBJECTIVES

The aims and objectives of the study are

- To study the relationship between specific treatment variables and functional outcome among patients undergoing post burn breast reconstruction as measured by
    - Symmetry of breast
    - Location of inframammary line
    - Breast projection
    - Scarring
- To measure the effect of duration of contracture and patient age on the above outcome and the types of surgery.

INTRODUCTION

The disabilities arising from severe burn injuries have certain unique characteristics not shared by other diseases. Burn patients are more likely to have and remember dramatic circumstances surrounding their injuries. Furthermore, their appearance evokes public avoidance and repulsion than sympathy.[1]These problems may be further accentuated in female patients with significant deformities of breast as a result of thermal injury. Far from posing merely cosmetic problem, such deformities deeply disturb both the patient's perception of her body and her emotional balance and they can markedly diminish patient's self esteem and well being.[2]The patient with a breast deformity presents the reconstructive surgeon with a special opportunity and challenge: the opportunity to restore her emotional health and sense of well being and challenge to create an aesthetically pleasing breast. To achieve the proper results for each patient, there are a myriad of surgical procedures for modification and reconstruction of the breast deformities.[3]Burns of the anterior chest wall cause various deformities which are related to the burn agent, the depth and extent of injury and the age of the patient. [4]

In the young female patient, severe thermal burns restrict normal breast development, while in adult female patients they cause severe disfigurement of the breast, resulting in significant asymmetry and displacement of the nipple areola complex.[5]

Burns of the anterior chest wall can cause significant distortion to the developing breast. Whenever the breast analogue has been damaged, varying degree of maldevelopment may occur. However, most authors believe that the breast bud is rarely totally damaged by

the burn trauma itself. Loss or distortion of the areola and nipple complex does not necessarily indicate that the underlying gland will not develop nor that lactation will not occur after pregnancy [6].There are many indications to operate and repair post burn breast deformities. Burns to the anterior chest can cause significant distortion to the developing breast, abnormal breast development can result from regional scar formation distorting skin position, leading to abnormal breast location. Complete coverage of the breast by hypertrophic scar can prevent expansion of breast mound by direct pressure. In addition, anterior axillary contractures and neck contractures can contract the breast mound laterally or superiorly. Burn to the breast can also lead to loss or distortion of the areola and nipple complex and loss of the inframammary fold. A wide range of procedures has been described to deal with these problems

REVIEW OF LITERATURE

Anatomy of breast

The female breast is one of the signs of femininity that consists of a group of highly specialized cutaneous glands

Shape

The transverse shape of the young adult female breast can be represented best as a cone with a spherical surface contour, an arched base and an eccentrically situated top deviated fifteen degrees laterally. Using nipple as a reference point, each breast is divided into four quadrants Superolateral, superomedial, inferolateral and inferomedial. In addition, there is a retroareolar area and axillary tail.[7]

Extension

The breast tissue extends from the second to the sixth ribs and from the para-sternum to the mid-axillary lines. However, the glandular tissue extends upwards to the clavicle, downwards below the costal arch, medially to the midline and in about 95% of women, laterally to the axillary fossa as the axillary tail of Spence. The axillary tail of Spence passes through a foramen in the axillary fascia known as the foramen of Langer. [8]

The breast parenchyma lies between the deep layer of the superficial fascia and the fascial investment of the pectoralis major muscle (about two third of breast tissue). The other

one third is related to the serratus anterior muscle and aponeurosis of the external oblique muscle.[9]

The retromammary space is a bloodless plane containing some loose areolar tissue, small blood vessels and lymphatics. Thickenings called posterior ligaments, extend from the deep surface of breast to the deep pectoral fascia. Another bloodless plane lies just deep to the dermis, in thin individuals. This plane is 2-3 m deep to the skin. Fibrous tissue strands extend from the deep fascia to the skin. These are called the ligament of Asteley cooper, which are responsible for the appearance of the young female breast. With age, they become atrophic and allow the breast to drop.

Size and weight

There is a tremendous variation in the size and the weight of the female breast. At maturity, the glandular portion has a distinctive protuberance conical form. The base of the cone is roughly circular, measuring 10-12cm in diameter and 5-7 cm in thickness.[7]

The nulliparous females have typical hemispherical configuration, whereas the multiparous females, who experienced hormonal stimulation associated with pregnancy and lactation, have pendulous and larger breasts. Postmenopausal, the breast usually decreases in volume.[10]The typical non lactating breast weights between150-225gm, whereas the lactating one exceeds 500gm.[10]

Nipple areola complex

The areola is a circular area of skin around the nipple, variable in size, pink white in nulliparous and dark brown in multiparous women. The areola contains numerous sebaceous glands, Montgomery glands, which secret an oily material for lubrication of areola.[11]

The nipple is a conical or cylindrical prominence that is located in the center of the areola. In nulliparous females, the nipples are usually situated at the level of fourth intercostal spaces. However, the position of the nipples varies even in the same women. The tip of the nipple is formed of a circulatory arranged smooth muscles fibers that compress the lactiferous ducts and erect the nipple when they contract.[11]

Consistency

The breast is composed of acini, which together make lobules and lobes of the gland. The lobes are arranged in radiating fashion, converging towards the nipple where each one is dilated into an ampulla beneath the areola forming lactiferous sinuses, where they open separately on the summit of the nipple. [12]

Blood supply of the breast

Arterial supply

Blood supply of the breast comes from many sources and within the breast the breast arterial interconnection leads to collateralization of flow.[13]

(1) Lateral thoracic artery:

The lateral thoracic artery is a branch from the second part of the axillary artery. It is the main source of blood supply for the lateral part of the mammary gland. In the absence of this artery, the thoracodorsal artery, which is the continuation of the subscapular artery from the third part of the axillary artery, becomes the main source of blood supply.[8]

(2) Internal Mammary Arteries

The internal mammary arteries are branches from the first part of the subclavian artery. They course downwards along the lateral border of the sternum, sending branches through the intercostal spaces to supply the medial part of the breast. [14]

(3) Intercostal Perforators

The intercostal perforators are the lateral branches of the second, third and fourth posterior intercostal arteries, which supply the inferior and lateral part of the breast.[14]

Venous drainage

The venous drainage can be classified into superficial subcutaneous vein and deep veins.[15]

A. The superficial subcutaneous veins

Around the nipple the superficial subcutaneous veins form the anastomatic circle, the circulus venosus. The superficial veins radiate from this circle to the periphery of the breast

then unite into vessels, which join the internal mammary, axillary and posterior intercostals veins. The majority of these veins drain into the internal mammary vein.[15]

B. The Deep Veins

The deep veins drain along the routes roughly corresponding to the arterial blood supply.[16]

1. The peforating branches of the internal mammary veins: These are the largest veins draining the breast.They end finally into the innominate veins, then to the pulmonary capillary network.

2. Multiple tributaries to the axillary vein

3. The intercostal veins

They are one of the most important routes of venous drainage from the breast. They travel posteriorly to the vertebral veins and hence to the azygos veins and superior vena cava. They are the third pathway from the breast to the lungs .[17]

C. The Vertebral System of Veins

This is a separate system paralleling the caval system. They drain not only the vertebrae but also the bones of the pelvis, upper end of the femur, the shoulder girdle, upper end of the humerus and the skull. [17]The anastomosis of the deep veins of the breast with vertebral veins through the intercostals veins is the explanation for the metastasis of breast

cancer to the vertebral bodies or even the sacrum or pelvis without presence of metastasis deposits in the lungs.[16]

Innervation of the Breast

The breast has a segmental sensory innervation that follows the distribution of the intercostals nerves, which are subdivided into an anterior and posterior nerve rami. The anterior ramus courses laterally in the intercostals space to about the level of the anterior axillary line, where, after piercing the serratus anterior, it gives rise to a lateral cutaneous branch. The main ramus then continues anteriorly where it terminates in the midline as the anterior cutaneous branch.[16] The smooth muscles present in blood vessels and nipple-areola complex receive their innervation via the sympathetic nervous system.[18]

Lymphatic Drainage of the breast

In the subareolar area, there is a particularly numerous meshwork of lymphatics that widens peripherally to form a dense circumareolar plexus (Retroareolar plexus of sappy).From this, enormous external and internal trunks are the main routes of lymphatic drainage from the breast to axilla:

1. The External Trunk

Passes from the subareolar plexus to the outer border of the pectoralis major and receives collaterals from the upper half of the breast.

2. The Internal Trunk

From the medial edge of subareolar plexus to the outer border of the pectoralis major and receives tributaries from the lower half of the breast.Both these trunks pass around the outer edge of the pectoralis major muscles, then penetrate the costo-coracoid fascia and terminate in the axillary lymph nodes.[17]There are two accessory routes of lymphatic drainage from the breast to the nodes at the apex of the axilla, these are

a. The Transpectoral route

Begins as a retromammary plexus of lymphatics. Then, they perforate the pectoralis major and following the course of the pectoral branch of the thoracoacromial artery, empties into the subclavian group of axilllary lymph nodes.

b. The Retropectoral route

It is a lymphatic pathway found in about one third of subjects and drains the upper internal portion of the breast. It runs laterally to rotate around the outer edge of pectoralis major and then runs upward on its under surface or under the pectoralis minor to the apex of the axilla where it empties into the subclaicular group of axillary lymph nodes. This group is a more direct pathway to the subclavicular nodes than the main lymphatic route. [16]

Lymphatic drainage to the Internal Mammary Nodes

The central and medial lymphatics of the breast pass medially along the course of the blood vessels perforating down through the pectoralis muscle and empty into the internal

mammary chain of nodes situated in the interspaces between the costal cartilages within 3cm of the sternal edge.[17]

Lymphatic Drainage to the Contralateral Axillary lymph nodes

The crossing of skin lymphatics from one breast area to the opposite side provides one explanation for metastasis reaching the opposite axilla in breast cancer. A second route for such contralateral spread is along the deep pectoral fascia lymphatics from one side to the other.[17]

Lymphatic Drainage of the Muscles of the Chest Wall

These follow the general course of their blood supply.The lymphatics of the medial portion of pectoralis minor muscles empty into the internal mammary lymph nodes, while the lateral portions drain to the axillary lymph nodes. [16]

ANTHROPOMORPHIC BREAST MEASURMENT

The breast is an organ with varied volume, width, height, projection, tissue density, composition, shape and position on the chest wall. The aesthetically perfect breast was defined as a non-ptotic breast in which no common aesthetic procedure would be considered appropriate to enhance the breast's form. Although the results of the measurements indicate the range and variance in the asthetically perfect breast, there still was a statistically significant correlation of some of the parameters of the breast and torso shape to breast volume. These correlation can be used preoperatively to predict the desired breast shape and volume in breast reconstruction. Definition of parameters measured to determine the aesthetically perfect breast include:

1. SSN- IMF: The vertical midline measurement from SSN to the point level with most inferior point of the inframammary fold.

2. SSN- Xiphoid : (16.73- 17.4cm)

3. SSN- Umbilicus: (33.51-34.9cm)

4. SSN- Pubis: (47.6-48.9cm)

5. SSN-Center of the nipple(Ni),(18.6-19.3cm)

6. Nipple-Clavicle: The vertical measurement from a point 5cm lateral to the clavicular-manubrial joint,(18.6-23cm)

7. Nipple to nipple: the horizontal measurement of the center of both nipples, (19.35-20.76cm)

8. Areola-IMF: The vertical measurement of the inferior areolar edge to the most dependant point of the breast,(5.1-6.1cm)

9. Nipple width,(3.49-4cm)

10. Nipple height,(3.69-4.2cm)

11. Breast projection :it is measured at 90 degrees to the chest wall just beneath the breast(12-16cm)

12. Chest circumference: This is measured at the level of the most inferior point of IMF

13. The ideal nipple line is defined as a level to the midpoint on the shaft of the humerus.

14. Volume: The volume of the breast, (260-340cm3).

The formula to calculate the volume of breast:

Volume = (SSN-Ni) 1.103x (Ni-Ni) 0.811

On average, the size desired are between 1-2 standard deviations above the predicted volume.[19]

SURGICAL TECHNQUE

The goals of breast reconstruction are

1) To restore the breast mound and contour.

2) To achieve symmetry between the reconstructed breast and the remaining natural breast.

3) Reconstruction of the nipple-areola complex.

4) Psychological benefits of breast reconstruction.[20]

SKIN GRAFTS

Free skin grafts dates back as far as 2000BC.The first sufficient description of the use of a full thickness skin graft was by John Reisberg Wolfe (1823-1904), a Hungarian ophthalmic Surgeon. He used a full thickness skin graft from the fore arm to release a post burn contracture (lower eyelid ectropion). Since then many surgeons have used skin graft to release post burn contractures at various other sites.Full thickness skin graft-consists of epidermis and full thickness of dermis. Split thickness skin graft-consists of epidermis and a variable of dermis. Split thickness skin graft are described as thin, intermediate or thick according to the thickness of dermis included.

Iwuagwu et al [21] described the advantage of skin grafts is that one is importing new, nonbulky skin from a previously uninjured area of the body instead of traumatizing the scarred skin or compromised adjacent skin.

Marion Mueller et al [51] described abdominal skin is a good donor site for large area full thickness graft for breast resurfacing because the skin color and texture are similar to the light colored soft skin of breast.

Method of harvesting:

The full thickness skin graft is cut with a scalpel while split thickness graft is usually cut with a special instrument. The full thickness graft once cut leaves behind no epidermal elements in the donor area from which resurfacing can takes place. The split thickness skin graft leaves adenexal remnants, pilosebaseous follicles and sweat gland apparatus, as foci from which the donor site can resurface. As a result the donor area of a split thickness graft heals spontaneously, and requires no care other than that usually accorded any raw surface. The donor area of a full thickness skin graft has to be closed by direct suture or if it is too large for this, covered with a split skin graft.

The properties of full thickness skin graft are relatively constant; those of the split skin graft depend in some degree on the thickness of its dermal component. The full thickness skin graft takes less readily than the split skin graft and before it can be used successfully conditions have to be optimal. The full thickness skin graft remains virtually at its original size. The split thickness graft tends to contract subsequently if circumstances permit, e.g. across a flexure. The stability of a graft depends on dermis, and the thicker graft

stands late trauma better than the thin graft .During its transfer from donor to recipient site a free graft is completely, even if temporarily, detached from the body. While so detached such a graft remains viable for a limited period whose precise limit depends on the ambient temperature at which the graft is maintained .In order to survive permanently it has to become reattached, and obtained a fresh blood supply from its new habitat. The process which results in its reattachment and revascularization are collectively referred to as take. The process of take consists of fibrin adhesion, revascularization and maturation.

Donor site:

Split thickness graft:

1. Thighs
2. Arms
3. Buttocks
4. Abdomen

Full thickness graft

1. Post auricular skin
2. Upper eyelid skin
3. Supraclavicular skin

4. Flexural skin

5. Thighs and abdominal skin.

Assessment of graft thickness is mainly by noting translucency of the graft, the pattern of bleeding of donor site that is a high density of thin bleeding points means thin graft. Thicker graft gives a lower density of larger bleeding points. In studies it has been found that for the same site, release with split thickness grafts was associated with more release of contracture than with the full thickness skin grafts .[21] Also,the interval between the initial release and first release as shorter than with the full thickness skin grafts. It was also noted that children required more procedures during growth spurts, reflecting the differential effect of the growth of the normal skin and contracture tissue. Patient reported more satisfaction with the texture and color match with the full thickness skin grafts. There was comparable donor-site and graft morbidity with both graft types.

Donor site morbidity:

1. Infection usually with staphylococcus aureus

2. Hypertropic scars

Graft site morbidity:

1. Lumpiness and hypertrophy

2. Excessive hair growth

3. Graft discolouration/pigmentary changes

4. Sensory disorders-pain, paraesthesia, numbness

5. Infection

6. Partial loss

7. Poor wound healing/unstable scar after trauma.

Full thickness skin grafts approximate more closely to normal skin in texture, color, and resilience than split-thickness grafts. However full thickness skin grafts take less readily than split thickness grafts and suffer the setback of limited availability. [22,23]The latter problem, in some situation, may be offset by pre-expansion of the donor sites [.24] Full thickness grafts also contract much less, as in an inverse relationship between thickness of the dermis and graft contraction.[25,26,27] The use of skin grafts for post burn contracture release is simple reliable and safe. They are particularly useful for an extensive area of release. Their main disadvantage is the tendency to contracture, necessitating further release, which is less of a problem when using full thickness grafts. Whenever possible, use of full thickness skin grafts in preference to split thickness graft in post burn contracture release.

TISSUE EXPANSION

The concept of tissue expansion in plastic surgery was introduced by Neuman in 1957. In 1979, it was adapted for use in breast reconstruction. The method's apparent simplicity and versatility made it popular, since it seemed to obviate the need for distant flaps in many cases.[28]

In more severe burns, in which breast parenchyma s still present or only minimally destroyed ,but in which more extensive grafting is needed, the principles of tissue expansion can be used in two ways. The expander can be used to release scar contractures by prolonged internal internal pressure effect and also to expand locally unburned skin ,which can in turn be used as pedicle coverage to reconstruct the burned skin envelop

Rona C et al [52] described approach of expansion prior to contracture release appears aesthetically adequate ,however **Henry W et al**[52], estimate that it is not ideal .To improve on the " patchwork-quilt appearance" and the poorly defined and low reconstructed inframammary fold, they suggest that excisional release of the periareolar scar contracture and incisional inframammary release to the chest wall prior to expansion could produce a crisper ,more symmetrical fold with an improved skin envelope appearance. Also expansion after excision and grafting allows more symmetrical enlargement and diminish the unpredictable differential expansion between overlying restricting burned skin and supple unburned skin.

Principles of tissue expansion

A tissue expander is simply an empty silicone bag that is placed through the mastectomy incision beneath the musculofascial layer. It has either a contained valve or a small tubing and a filling valve placed beneath the skin of the lateral chest wall.[28] After the wound has healed, the tissue expander is gradually inflated by injections of 50 to 200 ml of saline. Many surgeons slightly over-inflate the expander in relation to the opposite breast to decrease the likelihood of scar capsule contracture. Once the local tissues are expanded to the surgeon's satisfaction, the tissue expander is removed under local or general anesthesia and the permanent breast implant is placed under subpectoral muscle pocket.

The breast reconstruction can not be considered successful unless acceptable symmetry with the opposite breast is achieved. The expanders provide larger reconstructed breasts, therefore minimizing the number of reductions of the natural opposite breast.[29] In burned breast expansion after excision and grafting allows more symmetrical enlargement and diminishes the unpredictable differential expansion between overlying, restricting burned skin and supple unburned skin. [30]

Types of Breast expanders

There are two distinctly different types of breast expansion devices

1. Radovan type: which is expanded with saline

2. Becker style implant: double-lumen permanent expander implant,

Recent advances in expander design include improvements in shape, the development of textured surfaces, and alterations in valve design. Taken together, these changes have enhanced the aesthetic results of tissue expander breast reconstruction and decreased the number of complications. [31]

Tissue expanders have many advantages over the use of flaps for breast reconstruction as:

a. The skin color and texture are identical.

b. There is maximum control over the size adjustment of the prosthesis.

c. Avoidance of the debilitating problems caused by the removal of muscle and tissue at the site of donor flaps.

d. In some sense, the woman sometimes feels that she is regrowing her missing breast.

e. With expanders, the opposite breast can be matched without the need for additional scars. However, tissue expansion does not eliminate the use of other methods of breast reconstruction and if there is a less adequate or unsatisfactory result with this method, the TRAM flap and latissimus dorsi muscle flap should be used.

Disadvantages

1. Placement of an expander frequently necessitates a second operation for exchange with a permanent prosthesis, however, use of permanent expander/implant device may reduce the need for this second procedure.

2. Although textured surfaces have decreased the rate of capsular contracture, this still remains troublesome, resulting in firm and sometimes-painful breast.

3. Prosthetic devices are subjected to failure with leakage of gel or saline.

4. Saline devices may exhibit wrinkling, particularly when the soft tissue cover is thin.

5. For inflation of the device, multiple visits to the doctor's clinic are required. This can be avoided by teaching the patients to inflate the device by herself.

Technique

Using local or general anesthesia, the position of the temporary subcutaneous tissue expander is outlined on the chest. A 5 cm subaxillary incision or inframammary border of the pocket on the same line as the opposite breast. The pocket is developed mainly by a blunt scissors or finger dissection and preferably about 3 cm wider in circumference than the base of the expander. A small subcutaneous pocket is developed posterior to the incision for placement of the reservoir dome. The expander is initially filled with 50 to 100 cc of normal saline and any remaining air is expelled. The lower edge of the expander should reach the inframammary line.

The reservoir dome is placed posterior to the incision, which is then closed in two layers. It is important to approximate the subcutaneous tissues between the expander and the reservoir to prevent sliding of the reservoir toward the expander. Subsequent normal saline injections are performed according to the expansion protocol.

The expansion protocol

First stage

The expansion process usually begins within 2 weeks after insertion of the expander depending on the local wound condition. If there are any concerns regarding the wound healing, expansion should be delayed.

The skin overlying the injection site is carefully prepared with betadiene before insertion of a 21-gauge needle. Saline is then added (about 50cc to the expander to reach the end-point of moderate soft-tissue tension) Expansion continues usng either rapid or conventional method until the desired maximum point of projection is obtained. Once full expansion is obtained, the expander should remain in place for 4 to 6 months. This allows time for tissue adherence with the surface of the expander to develop, producing a mature, pliable capsule. This period of maximum expansion also prevents any recoil of the soft-tissue envelope once the expander is removed.

Second stage

Through the same subaxillary approach, the expander and the reservoir can be removed. The old scar is excised, and electrocautery can be used for dissection around the

expander or reservoir dome, as the device is heat resistant. If necessary, readjustment of the pocket should be performed by partial capsulotomy at the desired corners. The amount of normal saline in the expander should be calculated, and a smaller implant should be placed in the pocket, to allow mobility and flexibility of the reconstructed breast. The incision should then be closed in two or three layers.

Contraindications

Ideally, tissue expanders should not be inserted

- In the vicinity of an immature scar
- In the presence of infection
- In irradiated tissue.

Complications of prosthetic breast reconstruction

- Intra-operative complications

1. Muscular tears

If the pectoralis major muscle is traumatized at the time of during pocket dissection, the implant may herniate through the defect that may lead to skin erosion and implant exposure.

Management

i. -If the defect is small, repair may be sufficient by direct closure.

ii. -If the defect is medium or large, a TRAM flap with its overlying sheath based superiorly is turned up to cover the deficient muscles.

iii. -If there is extensive muscle tears, a tissue expander is placed and not inflated until it is considered safe 10-24 days later.

2. Deficient skin flaps to close the wound

As long as the implant has a complete musculofascial coverage, there is no concern regarding inferior migration of the implant resulting from this maneuver.

Management:

If there is excess tension on skin flaps following approximation the abdominal skin and subcutaneous tissues are undermined off the abdominal wall for a distance sufficient to allow advancement of the inferior flap and closure.

3. Skin flaps circulatory compromise

The patient is given intravenous fluorescen and the skin flaps are examined under the Wood's lamp.

Management

If there is still cause for concern, the implant is completely deflated to its gel component and nitropaste is applied. Intravenous corticosteroids are given to help protect against the effect of ischaemia on the skin flaps.

4. Haematoma

Management

If acute intraoperative haematoma occurs, the sutures must be removed and the haematoma is promptly evacuated and the bleeder could be managed before replacement of the implant, then proceed toward closure.

5. Pleural tear

This is more likely to occur if a curved scissors is used with the points towards the chest wall.

Management

If a small tear occurs sutures are initially placed and left untied. A small drain is inserted into the pleural space and placed on suction and removed while the suture is air tied. The adequacy of the repair can be tested also by filling the field with sterile saline and observing for bubbles during several inspiratory cycles.

- Early postoperative complications

1. Hematoma

This is unusual but may occur within the first 24 to 48 hours.

Management

There should be immediate exploration with control of bleeding, copious irrigation with dilute betadine and reinsertion of the implant.

2. Infection

The most common site of infection is the wound.

Management

Drainage is indicated. Since the implant is under the muscle, it is rarely involved. If there is infection in relation to the implant the latter is removed and the pocket is irrigated and drained. In this situation, it is probably wise not to implant another prosthesis for six months. Early replacement may result in another infection.

3. Wound breakdown

This is usually due to ischaemia of the wound edges due to either prolonged forcible retraction at surgery or closure under tension.

Management

Debridment then either secondary sutures or frequent dressing to inforce healing by secondary intension. Once the expander is exposed, it should be removed.

4. Implant displacement

This occurs most frequently in a cranial direction but may caudal or lateral.

Management

The pocket is reopened surgically and enlarged by incising the capsule with a cutting cautery in the direction of the desired implant positioning. In large displacements a portion of the pocket may have to be obliterated with non-absorbable sutures to prevent redisplacement.

5. Postoperative pain

A significant number of patients have complained of shoulder, arm and chest wall pain after immediate reconstruction and this may persist for many months. It is important in the preoperative interview to stress that the postoperative symptoms of pain, paraesthesia may be painful because of dissection to form the pocket, but this is short lived, in a few patients long term pain may occur, because of capsular contraction.

6. Rupture of implant

The ruptured implant is an uncommon complication. The symptoms and signs are frequently vague, the diagnosis is usually difficult. Patient with ruptured breast implant do

not necessarily have a history of trauma. A number of changes in the breast texture, symmetry and size imply breast implant rupture. Mammography is a good screening test and is very, accurate when silicone has migrated away from the implant.

Management

A number of procedures have been used to remove silicone from soft tissue, These procedures include:

- Suction assisted removal.

- Wide local excision of soft tissue and excisional biopsy of silicon granuloma.

7. Mondor's disease

Thrombophlebitis of some part of the superficial mammary venous plexus may result in a tender cord-like lesion. Extending out of the breast into the thoraco-epigastric vein

Management

Supportive measures with warm, moist compresses and salicylates. Spontaneous resolution usually occurs,

- Delayed postoperative complications

1. Capsular contracture

The formation of a postoperative fibrous tissue capsule around a mammary prosthesis occurs in all patients in varying degrees. However, there is no clinical significance unless the capsule contracts, causing pain, excess breast tissue firmness, a misshapen breast, increased palpability of the implant, wrinkling of the implant, or displacement of the prosthesis. Capsular contracture in implants with the Siltex surface has been a far less common occurrence than seen with smooth-walled implants of any variety either gel-filled or saline-filled. When tissue expansion is the goal, the development of capsular contracture during inflation is less frequent with the Siltex Becker expander implant than with the smooth-walled Radovan expander. The latter is frequently accompanied by scar contracture during expansion, and the contracted capsule must be addressed during the second stage of the expansion procedure then the Radovan expander is removed and is replaced by a permanent implant.

2. Rupture of implant or deflation of the expander

Deflation of the expander may also occur spontaneously or if punctured with a needle at the inflation time or ruptured by direct trauma.

Management:

Once it is ruptured it should be removed and replaced by either another expander or by an implant.

Postoperative care of prosthetic breast reconstruction:

1. The patient is advised to do massage of the breasts after 12 hours postoperatively and to wear a sling for 12-24 hours to give gentle pressure against the prosthesis and help control oozing of serum into the cavity.

2. The dressing and brassiere are retained unchanged for 2 weeks.

3. The patient should not raise the upper arm above the horizontal plane during this period, but gentle use of the arm is recommended.

4. At the end of this time, the dressing is removed although the patient is advised to retain a brassiere day and night for the next 6 weeks. The type and shape of the brassiere chosen by the patient will determine the shape of ensuring mound to a great extend.

LATISSIMUS DORSI FLAP

Severe burns to the chest wall damage both the breast bud and overlying skin so severely that there is a complete lack of breast development. In this situation conventional methods of breast reconstruction can be modified to suit the needs of burn patient.The latissimus dorsi musculocutaneous flap with or without an implant is useful in teenagers who have insufficient abdominal laxity to permit TRAM flap harvest. Back skin is often unburned and there fore creates a smooth natural breast mound. The skin paddle of the latissimus dorsi flap also offers a reliable bed for nipple areola reconstruction.[53]

Vascular anatomy

Dominant pedicle **:** Thoracodorsal artery and venae comitantes

Regional source **:** Subscapular artery and vein

Length **:** 8cm

Location: Enters the deep surface of the muscle in the posterior axilla 10cms inferior to the muscle insertion into the humerus. Secondary segmental pedicles: Lateral row four to six perforating arterial branches and venae comitantes. Medial row four to six perforating vessels and venae comitantes.

Function: The latissimus dorsi muscle adducts, extends, and rotates the humerus medially. It is an expendable muscle since function is preserved by the remaining synergestic shoulder girdle muscles.

Procedure

The latissimus dorsi musculocutaneous flap, described by Tolhurst and Haeseker in 1982, has been advocated as reliable for reconstruction of breast burn contracture.[33]The reconstructive procedure is performed in standard fashion. [34]The patient was placed in the mid lateral position, while the latissimus dorsi myocutaneous flap was elevated. Orientation of the skin paddle was either vertical or horizontal, depending on the donor area suitability and the shape and position of the recipient site. The skin was sutured temporarily to the muscle fascia early in the procedure to avoid shearing any musculocutaneous perforators.

The thoracodorsal pedicle was dissected as high as necessary to allow the flap to reach the far aspect of the recipient site. The latissimus dorsi myocutaneous flap was passed in the subcutaneous plane, under the axillary skin superficial to the pectoralis major muscle and clavicle. To provide a tunnel without any compromise to the vascular pedicle, any overlying scar tissue, as well as part of the pectoralis major muscle, was divided as needed. The donor site was closed primarily. For insetting the flap into the defect, the patient was repositioned in the supine position. Because it is doubtful that a latissimus dorsi fasciocutaneous flap could provide sufficient, reliable skin coverage for severe breast contractures, skin grafting would probably be required to close the donor sites. This robust flap is a dependable reconstructive option because of the reliable vascular supply to the muscle and skin. Both the long vascular pedicle of the latissimus dorsi muscle and a pivot point in the axilla allow this flap to easily reach the anterior chest wall.

TRANSVERSE RECTUS ABDOMINIS FLAP

Transverse rectus abdominis myocutaneous flap are less useful in burned breast reconstruction in young patents It can be an option for an older patient or one with ample unburned abdominal tissue.[54]

Vascular anatomy

1) Dominant pedicle: Superior epigastric artery and vein

Regional source **:** Internal mammary artery and vein

Length **:** 2cm, Diameter: 1.8mm

Location: The pedicle enters the medial to the midposterior third of the muscle

2) Dominant pedicle: Inferior epigastric artery and vein

Regional source **:** External artery and vein

Length **:** 5cm, Diameter: 2.5mm

Location: The pedicle enters the lateral muscle 4cm superior to the fibers of origin

3) Minor pedicle: Subcostal and six or seven intercostals arteries and venae comitantes Features:

Location: This vertically oriented abdominal muscle extends between the costal margin and the pubis. It is a long, flat muscle with three tendinous intersections located at the level of the umbilicus, the xiphoid process and midway between the xiphoid process and the umbilicus. The muscle is enclosed by the anterior posterior rectus sheath.

Origin: The muscle has two tendons of origin. The crest of pubis and symphysis pubis.

Insertion: The muscle inserts in three fascicles into the cartilages of fifth, sixths and seventh ribs.

Function: The Rectus Abdominis muscle flexes the vertebral column and tenses the abdominal wall

Procedure

Patient positioning

The patient is ideally placed in the supine position for flap elevation. Flap elevation may also be performed in the lateral decubitus or lithotomy position if simultaneous access to the recipient site for the flap transposition is required.

Flap dimensions

Vertical Skin Islands:

The vertical skin island may be designed over the entire muscle or located on the distal or proximal muscles flap in relation to the flap base. The skin island may extend across the midline or beyond the lateral aspect of the muscle. The limitation of the skin island design is primarily related to achieving direct donor site closure. Closure of the donor site in the vertical direction is generally limited to a width of 6to 8cm.

Horizontal Skin Island:

This transverse skin island is typically located opposite or distal to the flap base. Thus, if the flap is based inferiorly, the skin island is located at the costal margin. In the superiorly based flap the skin island is located on the inferior abdomen between the umbilicus and pubic hairline. Although the skin island may extend completely across the abdominal wall between the anterior axillary lines, the skin island circulation is less reliable between the midclavicular line and the anterior axillary line, especially on the contralateral

side of the abdomen. The skin island dimensions (especially the flap vertical width) are primarily determined by the ability to achieve direct closure.

Incisions:

For a muscle flap the initial incision is located vertically over the muscle. For a musculocutaneous flap the incisions extends around the skin island with an optional vertical incision extending to the muscle flap base.

Muscle and Fascia

The muscle is identified after incising the overlying anterior rectus sheath. When a skin island is used. it is essential to preserve the continuity of the skin island with the underlying anterior rectus sheath and the rectus abdominis muscle to preserve the musculocutaneous perforating vessels.

Distal extent of flap

In a superiorly based rectus muscle flap the muscle is either divided from its origin at the crest of the pubis or at the inferior edge of its associated skin island.In an inferiorly based flap the muscle is either divided at the costal margin or the muscle length increased by dividing the muscle from its insertions into the fifth through seventh costal cartilages.

Precautions

- Prior abdominal incision(Kocher incision, Pfannenstiel incision)

- Patient with impaired microcirculation

- Prior use of internal mammary artery for cardiac revascularization

- Prior major vascular surgery including external illac vessels.

SCAPULAR ISLAND FLAP

Mayou et al, [35] Mentioned scapular flap was used together with a latissimus dorsi flap to reconstruct a burned axilla and breast. In view of its relative proximity to the breast and reliable vascular supply, the scapular flap was examined as an autologous tissue island flap to salvage partial failure of breast reconstruction by providing skin or modest volume replacement when other surgical options were not available.

Vascular Anatomy

The circumflex scapular artery is a branch of the scapular artery which takes origin off the axillary artery. The circumflex scapular artery arises about 1to 4 cm off the axillary artery, but can on occasion arise directly from the axillary artery. After the circumflex scapular artery pierces the triangular space it sprouts a transverse cutaneous scapular branch and and a vertical parascapular branch. The scapular flap based on the cutaneous branches of the subscapular artery. The subscapular artery pedicle can be from 3to 6 cm in length with vessel circumference at this level up to 4 millimeters in size. Although the circumflex scapular artery is usually accompanied by two venae comitante, the subscapular artery is typically accompanied by one vein. The pedicle is marked out with an equilateral “scapular

triangle" using the most prominent part of the scapular spine laterally, the root of the scapular spine, and a corresponding point on the lateral border of the scapula respectively. The latter represents the point of emergence of the circumflex scapular artery and its branches from the muscular omotricipital triangle and into the fascial layer. It has been found that these three points maintain an equilateral triangle on the scapula in both full adduction and abduction. Although the point of emergence of the vascular pedicle varies with the movement of scapula, this geometric relationship is maintained. It is important to ensure that the root of the scapular spine is not mistaken for the superior angle of the scapula. This can be avoided by marking the patient in her operating position either in full abduction or in full abduction, when the bony landmarks are most prominent.

Flap dissection

The flap is outlined with the patient in a sitting position prior to the induction of anesthesia. The location of the vascular pedicle palpated in an area defined by the lateral edge of the scapula, the teres major and the deltoid muscle just superficial to the triangular space. Doppler may also be used to confirm the pedicle and presence of terminal horizontal branch of the circumflex scapular artery in order to center the flap properly over these vessels. The flap is designed so that its lateral margin overlies the triangular space and extends to but does not cross the midline. Flap dimensions are usually not more than 8cm in width and 15 cm in length.The patient is placed in lateral decubitus position on an inflatable bean bag. It is a fasciocutaneous flap. It has been elevated safely in a medial to lateral fashion superficial to the muscle fascia of the back. Care must be taken when approaching the infraspinous fossa where circumflex scapular artery sends several branches to the lateral

border of scapula. Careful division of these branches facilitates bloodless dissection and protection of the vascular pedicle as it enters the triangular space. After the dissection is extended into the axillae, the flap can be passed through the triangular space by retracting the long head of the triceps laterally. Division of the teres major facilitate pedicle dissection and also could be performed if the flap is too bulky. The donor site is closed in two layers over a large Jackson Pratt drain. The length of the vascular leash permits a large arc of rotation so that the flap can be positioned with great flexibility. It may be used for skin replacement or deepithelialized to replace volume as a buried flap in any quadrant of breast.

REDUCTION MAMMOPLASTY

Deep thermal burns of the anterior chest in adolescent female patients interfere with the normal development of the mammary glands. However, the breast tissue proper is often spared in thermal burns of the chest and breasts. Certain patients may develop mammary hypertrophy, just as in the unburned population.[55] In addition to the psychological burden of burn deformities, patients also voice the common complaints of women with macromastia. These complaints include back pain, neck and shoulder pain, shoulder grooving, and inframammary intertrigo. The standard treatment for symptomatic mammary hypertrophy is reduction mammaplasty. Although this treatment offers safe and reproducible results in unburned breasts, most surgeons have been reluctant to attempt reduction mammaplasty in patients with significant split-thickness skin grafts over breast tissue because of the potential for complications related to skin slough of undermined flaps.

Thai et al [56] described the approach to reduction mammaplasty in burned patients is similar to that used in patients with symptomatic macromastia. They believe that the inferior

pedicle technique offers consistent and reliable results . However, two important principles must be followed to minimize complications. First, tissues with split-thickness skin grafts lack the blood supply of the subdermal plexus. Because split-thickness skin grafts derive their blood supply directly from the underlying recipient bed, breast flaps with these grafts have a precarious blood supply. Overzealous undermining can lead to circulatory compromise of the flaps. They recommend maintaining moderately thick flaps (1.5 to 2.0 cm) and limiting undermining. Second, the inherent inelastic nature of the skin grafts can preclude wide transposition or advancement of such flaps. This principle is most apparent in the design of the keyhole area in the Wise pattern. A wide keyhole design can compromise closure of the breast flaps after reduction. Despite proper design of the Wise pattern, it is not unusual to see some evidence of delayed healing in the inverted-T area (i.e., the junction of the flaps). This can be allowed to heal secondarily if necessary.

THORACODORSAL PERFORATOR BASED CUTANEOUS FLAP

Using the myocutaneous flaps from the back results in an aestheticlly undesirable appearance and limitation of arm abduction, to overcome this disadvantage, the thoracodorsal perforator- based cutaneous flaps thin to preserve the subdermal vascular network, as with the other thinned musculocutaneous perforator-based flaps, and used to reconstruct breast.

Flap Design and Elevation:

First, the cutaneous perforators of the thoracodorsal artery on the back using a Doppler flow meter before the operation was marked. The musculocutaneous perforator usually emerge from the point 8to 10cm inferior to the axillary fold and 1to2cm posterior to

the lateral border of the latissimus dorsi muscle. The cutaneous flap was designed preoperatively, including the point where the cutaneous perforators were detected, as its long axis was perpendicular to the running of the latissmus dorsi muscle. The patient was placed in lateral decubitus position under general anesthesia. Preoperatively designed thoracodorsal perforator-based cutaneous flap was modified according to the defect. After incising the superomedial portion of the designed flap, it was raised to the level of the subcutaneous tissue above the dorsal thoracic fascia from the medial to lateral side, and the cutaneous perforators were identified near the lateral border of the latissimus dorsi muscle. After incising the superolateral portion of the flap,the main trunk of the vascular pedicle (the thoracodorsal vessels) was identified under the latissimus dorsi muscle and was deeply dissected beyond the branch to the serratus anterior muscle. The larger perforators were traced to it through the muscle with ligation of the other intramuscular branches. During this dissection, the thoracodorsal nerve and its branches were preserved. After the vascular pedicle was completely isolated the cutaneous flap was totally elevated.

Flap Thinning

After elevation of the flap, thining was performed. The superficial fascia in the elevated flap divides the adipose tissue into two types; relatively large fat lobules lie deeply, and the small fat lobule lies superficial, to this fascia. The adipose tissue lying deeply to the superficial fascia were removed using scissors. If needed, the superficial adipose tissue also could be removed. In the area around the cutaneous perforators, about 1cm of adipose tissue was preserved to avoid vascular pedicle injury. Finally,the flap thickness was reduced to

about 8to10mm almost uniformly after thinning.This cutaneous island flap was transposed into the defect, and the donor site was closed directly .

Z-PLASTY

Although the initial description of transposing equilateral triangular flap was described by Berger in1904, In the late 1920s,Limberg elucidated the geometric principles involved with z-lasty. He also noted that z-plasties, as well as related Limberg or rhombic flap, are best described as having both pivotal and an advancement component.

Principles

The basic principles of z-plasties is to transfer a lateral skin excess transversely to lengthen the areas along the line of contracture. The angle of z-plasty opens up and the amount of lengthening increases. By curving the z flaps an extra tissue in the flap base augments flap vascularity which is important in scarred tissue.

Advantage

- Change scar direction
- Interrupt scar linearity
- Lengthen scar contracture.

Geometry and design

The classic description of z-plasty consists of central limb and two peripheral limbs in the shape of Z such that two triangular flap of equal size are created. All three limbs are of identical length, and the central limb consists of scar that is to be lengthened or realigned. Although a 60 degree z-plasty is perhaps the most common design, angles between 30-90degree are possible. Changing the angle of the flaps will cause a change in the length gained in the axis of original central limb. Theoretically, the percentage gain in length increases with larger angles. However, the amount of lengthening noted in actual practice is usually less.

MULTIPLE Z-PLASTY

To reduce the amount of transverse shortening without significantly affecting the amount of lengthening has led to development of multiple z-plasty and Morestin in 1914 describe multiple z-plasty.

In the single z-plasty one large z extends along virtually the entire length of the contracture; in multiple z-plasty the contracture is viewed as having a number of segments, on each of which a small z-plasty is constructed.

RUNNING Y-V PLASTY

This flap was first described by Rolf R. Olbrisch in 1991.[36]To lengthen the scar cord, tissue is introduced from the side transverse to the course of the scar in the form of many consecutive push forward flaps running in opposite directions. These are cut as juxtaposed

y-v flaps. The smaller triangular is pushed into the stem of Y, so that a V is formed. Depending on the length of the Y stem, the lengthening of the scar is modified. Depending on the length of the Y stem, the lengthening of scar is modified. The deeper the push – forward flaps can penetrate into the Y stem, the wider its arms are pushed apart to lengthen the scar. The sum of the lengths of the divergent arms obtained in each individual Y-V push forward flap equals the gain in length of the scar to be corrected.

Flap design

A running zigzag line is drawn over the entire extent of the scar cord. Its arm length may be longer than the entire scar. At the tip of the running Y-V, the Y stem is now attached with a length that should be at least one - half of the V arms. The incision of the skin passes directly into a transaction of the scar tissue, then beneath it into soft fat tissue with normal blood flow or muscle fascia. Any mobilization of the wound margins wound be wrong. The wound margins of the scar spontaneously slide apart in a W form on the normal subcutaneous fat tissue, so that the scar appears lengthen with direct slackening in a wound that gapes open over its entire length. Without further reduction in the length of the scar, the lateral tips of the flap are inserted as a push forward flap into the corresponding defect. They slide easily over the entire deep base of the wound. The flap tips with their endangered blood flow do not have to be detached from their substratum or from the attached subcutaneous tissue.

Running Y-V plasty offers several advantages .[37, 38]

- The scar tissue is completely severed several times and staggered.

The scar skin is not rotated as a rotation flap freed of its substratum as in the z plasty, but slides on healthy subcutaneous tissue as a push forward flap. In this way, disorders of blood flow in the flap tips are avoided, as have repeatedly been observed in Z plasties in extensive burns. Y-V plasties can be cut without this danger, even in the center of large scar sections and connected scar cords, and can be used to lengthen the scars.

Disadvantage

The disadvantage of Y-V plasty compared with Z plasty is that the Y-V plasty must be sketched correctly from the beginning and must be definitively cut. In Z-plasty, the scar cord can be initially incised over its course, and the arms of the z are cut only as required afterward. Nonetheless, this flexibility is attained at the risk of blood flow disorders.

SUBCUTANEOUS PEDCLE RHOMBOID FLAP

Linear post burn contractures are usually released by z-plasty or v-y plasty, z-plasty and v-y plasty, however,are not effective for wide contracture or quadratic contracture with 2 or more contracture lines. In the treatment of such cases, the use of subcutaneous pedicle flaps is advantageous. The concept of subcutaneous pedicle flaps in the treatment of wide post burn contractures was first mentioned by Suzuki et al.[39] In 1994, Uzunismail et al, [40] described the subcutaneous pedicle rhomboid flap and the technique was successfully used in the treatment of digital and first web space contractures in the burned hand.

Surgical technique

Subcutaneous pedicle rhomboid flaps are designed along the long axis of the contracture line with 120- and 60-degree angles. The length of the flaps is as long as the contracture length. For long contracture, the length of the flap is not shorter than half of the contracture length. In cases of 2or 3contracture lines located closely to each other, single rhomboid flap may be used to release 2 different contracture lines. Flaps are incised down to the healthy subcutaneous tissue or muscle fascia so that they are freed from the surrounding tense skin. The tension over the contracture line is relieved by the relaxation incisions that are made in "cut as you go" manner. The emerged defects are then closed by suturing rhomboid flaps in v-y advancement along the long axis and y-v advancement along the the relaxation. The finesse of rhomboid flap depends on lengthening the contracture band by relaxation incisions and closing the emerged defect by suturing rhomboid flap in v-y and y-v advancement.

Advantages

1) Planning the rhomboid flap is simple and flexible as one has the freedom to adjust the amount of skin elongation by relaxation incisions.

2) The gain in length is not dependent on the angle of its constituent flaps, their numbers, or flap thickness, as is the case with z - plasty. In rhomboid flap technique, the relaxation incisions release the scar and the flap resurfaces the emerged defect.

3) Studies indicate that the rhomboid flap can easily close a defect generated by relaxation incisions, which produce a 75% to 90% gain in length, without need of skin grafting.[41]

4) As no undermining is carried out, the risk of flap necrosis is always less in rhomboid flap when compared with triangular flaps in z-plasty. The broad subcutaneous pedicle of the rhomboid flap is very reliable, and this gives the opportunity to apply the technique in wide burn scar area.

5) Distortion of the surrounding skin or displacement of anatomic landmarks is rare with this technique.

6) Another advantage of rhomboid flap technique is the capability of releasing 2 contracture lines with a single flap. When the contracture lines are too close to each other, using z-plasty for the release is nearly impossible because the bases of triangular flaps face to each other in all circumstances. In such cases, a single rhomboid flap may be designed between the 2 bands and the relaxation incisions may release both contractures.The broad subcutaneous pedicle of the rhomboid flap is very reliable. Even in the event of contracture recurrence, it is safe to design a new rhomboid flap over the old scars or adjacent to them as other non undermined flaps.

RECONSTRUCTION OF BURNED NIPPLE AREOLA COMPLEX

Complete reconstruction of the burned breast requires reconstruction of the nipple and areola. Restoration of these structures following traumatic and surgical ablation has been attempted by a variety of techniques. The repair procedure should not be performed until breast development is reasonably well advanced for fear of causing further destruction. For the nipple-areola complex reconstruction, it is advisable to wait at least three months until the breast mound has settled so that, the nipple-areola complex can be symmetrically positioned. It can be performed under local anesthesia since sensation from the breast mound is either entirely absent or diminished. Multiple techniques are available for reconstruction of the nipple and areola. The patient's native nipple-areola complex serves as a template. When the two breasts are nearly symmetric, the site of localization is measured from fixed points, the sternal notch, midline, midclavicular line and inframammary crease.[42]

- Areola reconstruction

If the normal contralateral areola is sufficiently large, it usually provides the best result when shared with the reconstructed breast. It is rotated in a circular fashion on the deepithelized bed of the reconstructed breast. The inner margin is sutured with 5/0 absorbable interrupted sutures, while the periphery is also closed with 5/0 silk sutures. After the nipple graft is placed, the ends of the sutures are tied over a bolus dressing which remain in place for 7-10 days. A split thickness dermal graft may be taken from the normal breast by a drum dermatome. Full thickness grafts from the upper inner thigh or the non-hair bearing inguinal crease are suitable for areola reconstruction. The texture and color of these grafts are

usually similar to the patient's areola and the skin graft will darken with time. Tattooing is a method to reconstruct the areola. Care is taken to use sufficient dark brown and red pigment in the tattooed area . The mid-portion of the tattooed area should be darker than the periphery to simulate a nipple.[43]

Dermabrasions

This technique is used in black females. It is safe, simple, and rapid and there is no need for a donor site. It depends on the hyperpigmentation of skin after split thickness removal in dark people.[44]

- **Nipple Reconstruction**

1. Composite graft from opposite nipple

The opposite nipple is the first choice as a donor area. This approach provides for a better symmetry and enables the surgeon to perform a biopsy from the opposite nipple. This is done by excision of the distal 1/3 or 1/2 of the normal nipple. This portion is transferred to the deepithelized recipient site in the center of the reconstructed areola, where it is sutured with 5/0 absorbable interrupted sutures. The donor defect is allowed to epithelize . The ear lobe is an excellent donor for the nipple projection and texture which are reasonable when compared to the opposite protuberant nipple without the disadvantage of violating the normal breast.[45] In this method, a clover leaf-shaped auricular graft is harvested from the inferior pole of the ear lobule. This composite graft is inserted into the deepithelized part of areola,

where it retains the pinkish appearance of the vascularized donor site. The donor site is closed directly or with Z-plasty.

2. Labial graft

The composite free labial graft is a time-honored method. A wedge is excised and the resulting defect is closed primarily with absorbable sutures. Any area around the labia minora may be used, as it is usually brown. This is the method of choice in bilateral NAC reconstruction.[46]

3. Toe pulp

It is done by using the pulp of the second to the fourth toe depending on the desired size. The donor site is left for contraction and reepithelization.

4. Reconstruction with local flap

a. T-flap

The T-shaped flap is based on the dermal plexus. The flap is elevated at the dermal fat level, the remainder of the skin within the areola marking is intradermally deepithelized. In shaping the nipple, the T-flap is folded on itself and the horizontal limb of the T-flap is warped around and sutured to the vertical limb along the lateral markings. The width of the transverse limb of the flap is about three times the desired diameter of the nipple. The nipple diameter is determined by the length of the vertical limb of the flap.[48]

b. Tetrapod flap

This technique gives a well formed projecting nipple. The site of the areola is marked with a No. 15 blade. Four opposing flaps are done based on a central disk forming a modified cross form. Once the four limbs are freed to the central disk, they are collectively lifted and the dermis around the nipple margin is incised. With 6/0 absorbable sutures, the pods are joined at their eight corners. A graft is applied to the donor site. A part of plastic syringe barrel is used to protect the nipple from pressure exerted by the tie-over dressing.

c. Ear lobule

The length and width is determined by the size of the other nipple. The amount of fat taken with the flap is determined by the volume of the opposite nipple. Care must be taken during release of fat for free projection to protect the delicate blood supply entering from the subdermal plexus at the base of the flap. The donor is closed primarily. No compressing dressing is used for three weeks.

- **Combined nipple and areola reconstruction**

1. Star flap

This technique is a one-stage procedure using a local flap that is tattooed immediately before its elevation in the same procedure. It has the advantages of being a reliable, safe and low cost method of nipple areola reconstruction. High patients' acceptance can be achieved by sharing them in process of color selection and nipple location. Several points should be emphasized about the modified " Star flap" technique: The nipple can be based inferiorly,

superiorly or laterally as local scarring dictates, but more natural projection appearance to the patient is obtained by basing the flap superiorly. The flap is primarily based on subdermal plexus but can be based reliably on a previous incision line if the scar is six or more weeks old. The "wings" of the flap will determine the nipple height, the height of the flap should be 150% the ultimate desired height allowing for 50% decrease in projection over time. The nipple flap is tattooed with darker pigments before flap elevation and excess pigment is removed with alcohol before incision. The flap is incised through dermis, preserving a base equal to the diameter of the nipple. The donor incisions are closed around the base of the nipple with 3/0 nylon to maintain projection. The "cap flap" is brought down and sutured loosely, and if the surgeon is satisfied with the projection and contour of the nipple, the remaining donor incisions are closed with interrupted 5-0 plain gut sutures. Finally, a thick coat of polysporin and a layer of xeroform are applied, followed by a 4x4 gauze with a hole cut centrally for the nipple.

2. Skate flap technique

Two wings are elevated on each side of a central base. The wings are elevated at the level of the deep dermis. The dermis at the base of each wing is incised into the subcutaneous tissue and the two wings are drawn out at 90 to the surface. The wings are wrapped around their base, and the donor wound is grafted to reconstruct an areola.

Surgical technique

The base of the flap is at 12 o'clock, if no scarring or tension exist. A line is drawn perpendicular to the base of the flap, three nipple diameters in length. The central third of this

line will be the future site of the composite flap. The length of the flap is measured as twice the height of the desired nipple. Different modifications of this flap are

- Modified skate flap
- Modified Fish-Tail Flap
- Quadrapod Flap
- H flap
- T flap
- Mushroom flap.

3. Modified double opposing-tab (MODT) flap

This is a method of nipple reconstruction derived from the original double opposing tab flap, using two local flaps containing skin and dermofat. The modifications allow closure of the donor site without skin graft and increase the blood supply to the flap.

Flap design and dimensions

The location of the nipple areola complex is selected, with the patient in upright position, by noting the position of nipple areola complex on the contralateral breast. The flaps are designed, with the long axis parallel to any preexisting scar. If no scars are present, the flaps are oriented in whatever direction best improves or maintains breast symmetry. The

typical dimensions of the flaps are with a width of 1.8cm; however, flap length or width can be altered slightly, if necessary.

Procedure

The flaps are elevated with No.15 scalpel and including some subcutaneous fat, so that total flap thickness is about 6mm.The flap base is freed only enough to allow the flaps to be moved into opposition, leaving the blood supply as intact as possible. Buried key sutures are placed from the base of one flap to the midpoint of the opposite one, and brought the two flaps together. The donor sites are closed primarily.The tips of the flap interdigitate and closed with interrupted sutures.

4. Propeller Flap

The propeller flap is indicated in either immediate single stage reconstruction or, as a second-stage procedure after breast mound is created. The advantages of the propeller flap, combined with tattooing for nipple areola reconstruction, include

- This is a simple one stage procedure
- A secondary procedure after nipple areola complex is eliminated
- A skin graft and second wound are eliminated.

Procedure

With the patient in sitting position, the location of the new nipple areola complex are outlined to match the contralateral side. The areola is tattooed. Tattooing is performed first thus eliminating the difficulty of coloring the skin after the papule has been raised. In the center of the new areola, a small circle ,approximating the diameter of the nipple, and two opposing propeller shaped flap are raised leaving the central core undisturbed. The central core is elevated after sharp dissection, beveling the incision away from the center and thereby creating a broad pedicle base. The flaps are then rotated around the center, creating the height for the new nipple. The donor areas are closed first, elevated new nipple is supported with needle through the base and light dressing applied.

MATERIALS AND METHODS

During the period from December 2006 to December 2008, Fourty (40) patients with post burn breast deformities were admitted in the Department of Plastic and Reconstructive Surgery, Christian Medical College, Vellore. In each patient, the cause of the burn, the age at the time of burn and at the time of admission to our department for correction of breast deformity, surgical techniques used for breast reconstruction, and cosmetic appearance of the breasts were reviewed.

Exclusion criteria:

1) All acute burns

2) Male patient with anterior chest wall burn.

Patient demographics

The total number of patients admitted with post burn breast deformities was 40. Out of this 14(35%) had bilateral involvement, 15(37.5%) had right side involvement and 11(27.5%) had left side involvement. In this study the mean age of burn injury was 15.5 years and the mean age of operative intervention was 15 years.

The severity of breast contracture was classified into three types according to the extent of the damage produced by the burn trauma.

- Severe burn scar- destruction of the breast bud and partial or complete lack of breast mound

- Moderate burn scar- breast tissue present but covered by contracting scar.

- Mild burn scar- segmental scar but with full-size breast tissue present

There were 9(22.5%) cases of mild deformities, 19(47%) cases of moderate deformities and 12(30%) cases of severe deformities.

The duration of post burn breast contracture and deformities is the time from the time of acute burns to the time when the patient under went surgical procedure has a mean years of 5 (range 1-10) .Patients were randomly divided into 2 groups the first group (20 patients) were managed by release and skin grafts; the second group (20 patients) were managed by release and use of local flaps. Local flaps used were Z-plasty, Y-V plasty, V-Y plasty, parascapular flap, sliding skin flap from the abdomen. Reduction mammoplasty was performed in one case.

Operative procedure

All patients had been admitted pre operatively and evaluated with proper documentation of the history and clinical findings. The patients were examined standing up, so that the opposite unburnred inframammary crease, if present can be used as landmark. The position of any remaining nipple-areola complex or palpable breast bud was noted. All patients were operated under general anaesthesia and supine position. For patients who

underwent parascapular flap for contracture release patient were initially put in supine and after contracture release the patient were turned in lateral position for flap elevation and insetting. The patient's whole chest is prepped and the opposite breast draped into the field to use as a comparison. All patients were administered one dose intravenous antibiotic at the time of induction.

In patient who underwent incision release and skin grafting tie over dressing was applied. The donor site was closed with paraffin dressing over the raw area. In patients who underwent flap surgery light wet dressing was applied. For patients who under went parascapular and sliding abdominal skin flap drains were placed below the flap after inset and one drain in the flap donor site. The flap donor site was closed primarily if possible without tension along the suture line otherwise the donor site was covered with split thickness skin graft. In the post operative period skin grafts were inspected on the 9th post operative day and the suture line care was given daily for the flap cases. Drains were removed on the second post operative day. In skin grafting case after removal of dressing on 9th post operative day patients were fitted with custom made garments to conform to the new breast contours. Reconstruction of the nipple areola complex was delayed 6 to 9 months until reconstruction of the breast mound is complete and scars are settled and supple.

The early and late postoperative results were evaluated; the patients were asked directly about their opinion of the result of the operation, immediately postoperative and at six months interval for 1&1/2 years aided by their pre-operative photographs. The results were graded as excellent, good, fair and poor.

The operating surgeon also evaluated the results retrospectively by review of photographs, with evaluation of symmetry, inframammary line, projection , ptosis and scarring. For each unit there is a score from 1 to 4 points.

The results were considered as

Poor: 0-5 points

Fair: 6-10 points

Good: 11-15 pointsExcellent: 16-20 points. Statistical analysis of all data was done using the SPSS 16.0 for windows.

OBSERVATION AND RESULTS

The summary of the clinical details are as follows

Table -1

BURN AGENT	FREQUENCY	PERCENTAGE
Thermal	37	92.5%
Scald	1	2.5%
Acid	2	5.0%
Total	**40**	**100%**

Out of 40 patients, 37(92.5%) had thermal burn, 1(2.5%) scald burn and 2(5%) acid burn (Tab-1). The most common agent was thermal burn. (Fig-1)

Table-2

AGE AT BURN (YEARS)	FREQUENCY	PERCENTAGE
1-10	12	30%
11-20	16	40%
21-30	7	17.5%
31-40	4	10%
>40	1	2.5%
Total	**40**	**100%**

Table-2 shows the mean age at the time of the burn was11-20 years. The youngest patient in this study was one year and the oldest patient was 50 years. (Fig-2)

Table-3

AGE AT OPERATION (YEARS)	FREQUENCY	PERCENTAGE
10-20	16	40%
21-30	15	37.5%
31-40	6	6%
>40	3	7.5%
Total	**40**	**100%**

Table -3, the mean age of hospital admission for post burn breast reconstruction was 10-20 years. (Fig-3)

Table -4

AGE INTERVAL IN YEARS	FREQUENCY	PERCENTAGE
1-10	33	82.5%
11-20	6	15%
21-30	1	2.5%

Table-4 and Fig-4 shows 33 (82.5%) cases came after interval of 1-10 years for reconstruction ,6(15%) came after 11-20 years and one case came after the 21-30 years of interval.

Out of 40 patient 14 cases (35%) had bilateral breast involvement, 15 cases (15%) had right side involvement and 11 cases (27.5%) had left sided involvement (Fig-5).

The most common complaint was the absence of inframammary fold, inadequate breast projection, undevelopment of breast and alteration of nipple-areola complex position. Out of fourty patient, 12(30%) had severe deformities, 19(47.5%) had moderate deformities and 9(22.5%) had mild deformities. (Fig-6)

Table-5

PROCEDURE	NO.OF PROCEDURE DONE	PERCENTAGE
Split thickness skin graft	20	50%
Z-plasty	8	17.5%
Y-V plasty	3	7.5%
V-Y plasty	2	5%
5-flap plasty	3	7.5%
Parascapular flap	2	5%
Sliding skin flap	1	2.5%
Reduction mammoplasty	1	2.5%
Total	**40**	**100%**

Table-5 shows 20 (50%) patients underwent release and grafting and another 20 patients underwent release and different fasciocutaneous flap cover. Z-plasty 8 (17.5%), Y-V plasty 3(7.5%), V-Y plasty2 (5%), 5 flap plasty 3(7.5%), sliding skin flap from abdomen 1(2.5%), parascapular flap2 (5%) reduction mammoplasty in 1(2.5%) .The commonest procedure done was split thickness skin grafting (Fig-7).

Out of 40 patients, nipple areola reconstruction was performed in 13(32.5%) cases. In 8 cases there was complete absence of nipple-areola complex. In first stage areola tattooing was done followed by nipple reconstruction using skate flap technique 6-12 months later. Another 5 cases there was malposition of nipple areola complex which was corrected by two subcutaneous pedicle flap technique (Fig-8)

Table-6 shows the complications in both groups.

COMPLICATONS	FREQUENCY	PERCENTAGE
Partial loss	7	17.5%
Hypertrophic scar	5	15%
Recontracture	6	12.5%
Total	18	45%

There were no major complications in the post operative period. In 5 patients who underwent incision release and split thickness skin grafting had graft loss raging from 2% to 10%.For 3 patients who had between 5 to10% graft loss re grafting was done to prevent healing by wound contracture and thus producing re contracture . For 2 patients who had 1to2% graft loss conservative management of regular dressing with hydrocoll moist dressings was carried out and wound healed within one week time. In 2 patienst of flap cases there was partial flap necrosis, which was healed by conservative management.

Hypertrophic scar

In 5 cases there was hypertrophic scar formation, which was managed by intralesional steroid injections, kelocot ointment and silicon gel sheet applications. 6 cases, among the skin graft developed recontrature. (Fig-9)

Table-7

The overall aesthetic results for patients.

Early postoperative results	**GROUP-1**	**GROUP-2**
Excellent	6	7
Good	7	8
Fair	4	4
Poor	3	1

T-Test

Table- 1

Group Statistics

	Early Post OP Result	N	Mean	Std. Deviation	Std. Error Mean
Patient	Ist Group	20	3.05	.759	.170
	IInd Group	20	2.50	.688	.154

Table-2

t-test for Equality of Means						
T	df	Sig. (2-ailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
					Lower	Upper
2.400	38	.021	.550	.229	.086	1.014
2.400	37.640	.021	.550	.229	.086	1.014

According to table-2 P value (.021< .05), means, early post op result in first group is statistically significant to second group means both group differ.

It is clearly showing in table-1, that first group mean >second group mean. Hence first group is better than second group (Fig-10)

Table-8

Late post operative result for patients

Late postoperative result	**GROUP-1**	**GROUP-2**
Excellent	5	6
Good	6	11
Fair	5	3
Poor	4	1

T-Test

Table-1

Group Statistics

	Late Post OP Result	N	Mean	Std. Deviation	Std. Error Mean
Patient	Ist Group	20	2.60	1.095	.245
	IInd Group	20	3.60	.503	.112

Table-2

t-test for Equality of Means						
T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
					Lower	Upper
-3.711	38	.001	-1.000	.270	-1.546	-.454
-3.711	26.660	.001	-1.000	.270	-1.553	-.447

According to table 2 P value (.001< .05), In late post op result first group is statistically significant to second group means both group differ

It is clearly showing in table-1 that first group mean < second group mean. Hence second group is better than first group. (Fig-11)

Table -9

The overall aesthetic results from the surgeons point of view

Early post operative result	**GROUP-1**	**GROUP-2**
Excellent	1	2
Good	10	12
Fair	5	3
Poor	4	3

T-Test

Table-1

Group Statistics

	Early Post OP Result	N	Mean	Std. Deviation	Std. Error Mean
Surgeon	Ist Group	20	2.95	.759	.170
	IInd Group	20	2.25	.786	.176

Table-2

t-test for Equality of Means						
T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
					Lower	Upper
2.864	38	.007	.700	.244	.205	1.195
2.864	37.953	.007	.700	.244	.205	1.195

According to table -2 P value (.007< .05), In early post op result first group is statistically significant to second group means both group differ

It is clearly showing in table-1 that first group mean >second group mean. Hence first group is better than second group.(Fig-12)

Table-10

Late postoperative result from the surgeons point of view.

Late postoperative results	**GROUP-1**	**GROUP-2**
Excellent	0	1
Good	9	12
Fair	7	6
Poor	4	1

T-Test

Table-1

Group Statistics

	Late Post OP Result	N	Mean	Std. Deviation	Std. Error Mean
Surgeon	First Group	20	2.35	.813	.182
	Second Group	20	3.15	.671	.150

Table-2

t-test for Equality of Means						
T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
					Lower	Upper
-3.395	38	.002	-.800	.236	-1.277	-.323
-3.395	36.682	.002	-.800	.236	-1.278	-.322

According to table-2 P value (.002< .05), In late post op result first group is statistically significant to second group means both group differ.

It is clearly showing in table-1 that first group mean < second group mean. Hence second group is better than first group.(Fig-13)

DISCUSSION

The female breast is regarded as a symbol of femininity and it plays a decisive role in a woman's sense of physical and emotional vitality. Deviation from normal size, shape, color, texture and symmetry are interpreted as unattractive. Far from posing merely a cosmetic problem, such deviations deeply disturb the patient's perception of her body and her emotional balance and they can markedly diminish patient self-esteem and well being. Surgical intervention may therefore be indicated for aesthetic and emotional reasons, which may often overlap. [2]

Although there are a myriad of surgical procedures for modification and reconstruction of the breast deformities and because reconstruction of a breast is an elective procedure, safety should be kept uppermost in the surgeons's mind.

In the present study the median age of burn injury was 15.5 years. Twelve cases (12) were burned at the age of 1-10 years ,16 cases were burned at the age of 10-20 years and 12 cases burned at an older age group. The most common burn agent in this study was thermal burn 37(92.5%) cases. Most of these burns were domestic.These data may lead to the possibility that suitable legislation and education will reduce the incidence of burns. Lack of education and a low economic status are thought to be associated with a high incidence of thermal injury.[49]

In our analysis 14 cases came with bilateral involvement, 15 cases had right side involvement and 11 cases had left side involvement. Among them 12 patient had severe

deformities, 19 had moderate deformities and 9 had mild deformities. Kadry et al. classified breast scar and contracture into: breast to axilla, breast to abdomen, breast to breast.

Postburn scarring and contracture affecting function remain the most frustrating late complications of burn injury. Contracture are produced not only by skin loss but also by the differential growth rate between the burn scar and rest of the adjacent normal skin and tissue.[21] Various techniques are used to release contractures; the choice depends on the location and/ or the availability of unaffected skin adjacent to the contracture or elsewhere. Reconstruction of the burned breast includes correction of contour deformities prior to reconstruction of nipple areola complex. Correction of contour deformities has been achieved using split thickness skin grafts, local flaps and myocutaneous flaps. In a study done by Kunert et al. and other studies in the literature the most common procedures done for post-burn breast reconstruction was release and grafts. In our study also 20 patient's underwent contracture released and split thickness skin grafting. In 5 cases there were partial graft loss and they underwent regrafting.5 cases developed hypertrophic scar and recontracture. The advantage of skin grafts is that one is importing new, nonbulky skin from previously uninjured area of the body instead of traumatizing the scarred or compromised adjacent skin but their disadvantage is that they have a tendency to recontacture, necessitating further release. Prolonged periods of postoperative physiotherapy, splinting and compression garments are required to maximize aesthetic and functional result.[21]

The flap type should be selected according to the location and shape of the scar. In case of mild and moderate deformities , where single contracture band was restricting the growth of breast tissue or causing deformities of breast, a skin elongation procedure such as

Z-plasty, running Y-V plasty was selected. 5-flap plasty and parascapular flap were used for the deformities involving the outer quadrant of the breast.Fig-17, shows the contracture causing upward displacement of breast without any functional restriction of shoulder joint movement,whch was released by 5-flap technique.

Sliding skin flap from the abdomen is based inferiorly at a level that allows the tissue to be brought upward onto the chest wall according to the need. It depends on a broad blood supply not from a single vessel,but from the two intricate networks of arteries that supply the anterior abdominal wall. This flap has given excellent results and has two advantages, first it builds up the inframammary line if it is lost as a sequel of burn. The second advantage is stretching the overlying skin over the fixed inframammary fold slowly, resulting in improvement over a period of 6 months with some ptosis. (Fig-14)

Complete reconstruction of the burned breast requires reconstruction of the nipple and areola.[50] In this study there was complete absence of nipple areola in 8 cases, among them 3 patient were having bilateral and 5 patient had unilateral involvement. 5 patient had post burn malpositioned nipple areola complex, which was corrected by two subcutaneous pedicle flap technique. Reconstruction of nipple and areola was done after the breast mound has fully settled from the previous release (6 to 12 months).Early appearance of areola reconstruction with tattooing and split-thickness graft was excellent. However, significant late hypopigmentation changes were observed with both techniques.The reason for less favorable results are depth of the burn injury or the thickness of the surviving dermal layer is inadequate for stabilization of the tattooed pigements. The graft take and subsequent problems with pigementation may be related to the same circulatory changes or to technical

aspects of harvesting and applying the grafts.50 All these patient nipple reconstruction was done by skate flap technique and postoperative results were evaluated based on physical examination as: Poor:less than 1mm of projection ,Fair:1-3 mm projection and Good: more than 3mm projecton.[50] In all patients nipple projection was good.

Certain patients may develop mammary hypertrophy, just as in the unburned population. In addition to the psychological burden of burn deformities, patients also voice the common complaints of women with macromastia. We performed reduction mammoplasty in one patient using inferior pedicle technique and result was satisfactory. The important principles must be followed to minimize complications are

1. Release distorted breast tissue with either incision or excision of burn scar followed by thick split-thickness skin grafts (0.016 to 0.020 inches).

2. Correct distortion of the nipple-areola complex with split-thickness skin grafts.

3. Allow sufficient healing time for the grafts (>6 months) before reduction mammaplasty.

4. Wait until the breasts are fully developed before performing reduction mammaplasty.

5. Be conservative when designing the Wise pattern, because the lack of elastic tissue precludes wide transposition or advancement of breast flaps.

6. Keep breast flaps with split-thickness skin grafts thick (1.5 to 2 cm) to minimize disruption of vascularity.

7. Consider balancing procedures at the same time or at a late

SUMMARY

In 40 patients, 37(92.5%) were burned by fire, 2(5%) acid and 1(2.5%) by scald. The mean age at the time of burn was 15.5 years. The youngest patient in this study was one year and the oldest patent was fifty years. The mean age at the time of hospital admission for reconstruction was 15 years. 33 (82.5%) cases came after interval of 1-10 years for reconstruction,6(15%) came after 11-20 years and one case came after the 21-30 years of interval. Out of 40 patient 14 cases (35%) had bilateral breast involvement, 15 cases (15%) had right side involvement and 11 cases (27.5%) had left sided involvement .The most common complaint was the absence of inframammary fold, inadequate breast projection, undevelopment of breast and alteration of nipple-areola complex position. Out of fourty patient, 12(30%) had severe deformities, 19(47.5%) had moderate deformities and 9(22.5%) had mild deformities. 20 (50%) patients underwent release and grafting and another 20 patients underwent release and different fasciocutaneous flap cover. Z-plasty 8 (17.5%), Y-V plasty 3(7.5%), V-Y plasty2 (5%), 5 flap plasty 3(7.5%), sliding skin flap from abdomen 1(2.5%), parascapular flap2 (5%) ,reduction mammoplasty in 1(2.5%).The commonest procedure done was split thickness skin grafting. Out of 40 patients, nipple areola reconstruction was performed in 13(32.5%) cases. In 8 cases there was complete absence of nipple-areola complex. In first stage areola tattooing was done followed by nipple reconstruction using skate flap technique 6-12 months later. Another 5 cases there was malposition of nipple areola complex which was corrected by two subcutaneous pedicle flap technique. Early appearance of areola reconstruction with tattooing and split-thickness graft was excellent. However, significant late hypopigmentation changes were observed with both techniques. The use of the inferior pedicle technique in burned hypertrophied and ptotic

breast helps to reduce the extent of burn scarring with preservation of the neurovascular integrity of the nipple-areola complex. In addition, there is no limitation regarding the use of this technique in cases of massive enlargement of the breast with postburn deformities, because reshaping of the ptotic and oversized breasts can be achieved nicely.

Because the age of onset of breast development varies widely from patient to patient, each case must be considered individually and therefore no set age for breast release can be recommended. Surgery indicated when there is bulging of breast tissue in unburned areas or when the scarred skin is obviously restricting breast

CONCLUSON

- There are several surgical principles to be considered and technique to be used in management of breast burns

- Reconstruction should begin when the burned breast envelope is insufficient and restrict normal growth.

- Best results are obtained if contracture release is complete

- Skin grafts had the disadvantages of poor quality of scar tissue and bad color matching with the rest of the breast skin. In cases of post-burn contracted scar of the breast obliterating the inframammary line and lateral projection of the breast, skin graft is not a proper solution After using skin grafts, loss of skin elasticity is constant findings

- Local flaps give better colour matching and better determination of the inframammary fold when it is lost. Also, using local flaps is better than skin grafts as regards the projection and proper breast contour.

- Post operative management should continue until wounds are mature and should include techniques to prevent contracture recurrence.

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PROFERMA FOR POST BURN BREAST CONTRACTURE

I: Socio-Demographic Data

-Name

-Hospital number

-Sex

-Age

-Address

-Maraital status

-Occupation

-Date of admission

II. General Information

-Date of burn: day/month/year

-Causes of burn

- Thermal burn
- Scald burn
- Chemical burn
- Electric burn

-Mode of injury

- Initial treatment

-Duration of burn contracture

- Deformities of breast

Deformities	Right breast	Left breast
-Hypertrohpic scar		
-Contracture i. Breast ii. NAC		
-Inframammary fold i. Present ii. Absent		
-NAC i. Present ii. Absent		

6. Types of surgical procedure

- Scar release by z-plasty, v-y plasty ,y-v plasty
- Scar incision/excision and partial thickness skin graft
- Scar incision/ excision and parascapular flap/sliding skin flap from anterior abdominal wall
- NAC reconstruction
- Reduction mammoplasty

-Post Operative complications:

Follow up;

At 6months,12months .

Compliance of the patient .

MASTER CHART

CASE NO	NAME	HOSP NO	AGE AT BURN	AGE AT SURGERY	BURN AGENT	SIDE	SEVERITY	SURGERY	NACR	COMPLI-CATIONS	EARLY GRP 1 PT.	EARLY GRP 1 SUR.	EARLY GRP 2 PT.	EARLY GRP2 SUR.	LATE GRP1 PT.	LATE GROUP1 SUR.	LATE GRP 2 PT.	LATE GROUP2 SUR.
1	BANDANA BHARATHI	463200C	1	13	1	1	1	1	1	2	3	3			2	2		
2	YAMUNA	623183C	5	20	1	2	3	2	2				4	3			4	3
3	TANUSHREE GIRI	146782C	6	16	1	1	1	1	1		4	3					3	3
4	MUSHARATHI M	215966C	2	11	2	2	3	4	2				4	3			4	3
5	AYSHAMAL S	278871C	15	26	1	2	2	5	2				2	1			3	3
6	SHABNAM KHATUN	402720C	13	17	3	3	3	5	2				4	3			4	3
7	GAYATRI	715256B	9	15	1	1	1	1	1		4	3			4	3		
8	ARPITA PRADHAN	817000B	7	16	1	1	1	1	1		4	3			4	3		
9	SOUMITA BOSE	912766C	3	16	1	1	1	1	1		4	4			4	3		
10	NINA ELDOSE	625532C	12	14	1	1	2	6	2				3	3			3	3
11	PALLABI MOITRA	897905C	28	32	1	1	2	6	2				4	4			4	3
12	GOVINDAMMAL	634476C	40	41	1	3	3	5	2	2			3	2			3	3
13	MASHIDA BEGUM	997470C	6	12	1	3	2	1	2	2	3	3			3	3		
14	RAJANI	187460C	20	28	1	1	1	1	1	4	4	3			4	3		
15	KALYANI DAS	087897D	15	22	1	3	2	4	2				3	3			3	3
16	LAKHAI DEVI	930446C	24	26	1	1	1	1	1	4	1	1			1	2		
17	MITSU SEN	115663D	18	22	1	1	1	1	2	4	2	1			2	1		
18	SANDHYA DEVI	939957C	24	25	1	1	2	2	2				2	1			3	2
19	MAUSUMI CHADA	890450C	28	31	1	3	2	5	2				2	2			3	2
20	SOUMIYA V	010729D	10	13	1	3	2	3	2				3	3			3	2
21	MANJULA J	020819D	8	10	1	2	2	5	2				3	3			3	2
22	ABIRAMI	022063D	7	11	1	2	1	3	1				3	3			3	3
23	THUMPA HALDAR		15	20	3	2	3	4	2				3	3			3	2
24	MALATHY		5	35	1	2	2	1	2		3	3			3	3		
25	JAYAMA	594850C	14	20	1	2	3	2	2	4			1	1			1	1
26	MARY CHANDRA	168834A	43	45	1	3	2	1	1	3	1	1			1	1		
27	CHAITALI BHAGAT	660820C	18	23	1	2	3	2	2	3			2	2			3	1
28	KALAIVANI	693205C	35	39	1	3	3	1	1	3	2	2			2	2		
29	PUSHPALATHA	792428C	12	14	1	2	3	1	1	3			4	3			3	3
30	RAJASHREE	818219C	20	26	1	2	2	1	2	2	3	2			3	2		

CASE NO	NAME	HOSP NO	AGE AT BURN	AGE AT SURGERY	BURN AGENT	SIDE	SEVERITY	SURGERY	NACR	COMPLI-CATIONS	EARLY GRP 1 PT.	EARLY GRP 1 SUR.	EARLY GRP 2 PT.	EARLY GRP2 SUR.	LATE GRP1 PT.	LATE GROUP1 SUR.	LATE GRP 2 PT.	LATE GROUP2 SUR.
31	AROKIAMAL	356788C	40	45	1	2	2	5	2				4	3			4	3
32	BANASHREE PAUL	042807D	24	26	1	3	2	6	2				4	4			4	4
33	KILASAMMA	067988D	35	40	1	1	1	1	2		4	3			2	2		
34	NITU DEVI	630140C	30	35	1	3	2	1	1	3	3	1			3	2		
35	AJHOLA DEVI	910574C	20	25	1	1	1	1	2	4	1	1			1	1		
36	SARITA MAHATA	166840C	15	24	1	2	2	1	2	2	2	2			1	1		
37	BINDU MANADAL	762394C	14	27	1	1	2	1	2		3	3			3	3		
38	MADHURILATHA	962324C	15	23	1	2	2	1	1	2	3	3			3	3		
39	ADILAKSHMI	893710C	16	28	1	3	2	1	2	3	2	2			2	2		
40	NANDINI AGRAWAL	872641C	26	28	1	2	1	2	2	2			3	3			3	2

Burn agent:
1-Thermal
2-Scald
3-Acid

Side of burn:
1-bilateral
2-right side
3-left side

Severity of deformities:
1-severe
2-moderate
3-mild

Surgery:
1-split skin graft
2-Z- plasty
3-Y –V plasty
4-V-Y plasty
5-5 flap plasty
6-Sliding skin flap
7-Reduction mammoplasty

NACR
1-Done
2-Not done

Complications:
1- Complete loss
2- Partial loss
3-Hypertrophic scar
4-Recontracture

Result:
1-poor – 0-5 point
2-Fair- 6-10 point
3- Good-11-15 point
4-Excellent-16-20 point